REMARKS

Reconsideration and allowance of the subject application are respectfully requested.

Claims 1-20 are pending in this application. Claims 1, 2, and 16 are independent.

Applicants thank the Examiner for careful consideration of the present invention.

The Examiner allowed Claims 1 and 16-20.

The Examiner objected to Claims 1, 5, 7, 9, 10, and 16-18, suggesting that the term "MPLS" should be changed to "Multi-Protocol Label Switching". Applicants have amended Claims 1, 5, 7, 9, 10, and 16-18, to replace "an MPLS" with "a Multi-Protocol Label Switching", in accordance with the Examiner's suggestion. No new matter has been introduced by way of the amendment. Applicants respectfully request that the Examiner withdraw the objection.

The Examiner objected to Claim 16, suggesting that the term "LSR" should be changed to "Label Switched Router". In response, Applicants have changed the expression 'a label switching router LSR' in Claim 16 to 'a label switching router (LSR)'. This change brings the use of the term 'LSR' in Claim 16 in line with its use in Claim 1. No new matter has been introduced by way of the amendment. Applicants respectfully request that the Examiner withdraw the objection.

Applicants have further amended Claims 2, and 3 to replace "an MPLS" with "a Multi-Protocol Label Switching".

The Examiner rejected Claims 2-8 and 11-15 under 35 U.S.C § 102(e) as being anticipated by Armitage, et al. (U.S. Patent No. 6,374,303), hereinafter referred to as Armitage. The Examiner rejected Claims 9-10 under 35 U.S.C § 103(a) as being unpatentable over Armitage in view of Anderson, et al. (U.S. Patent No 6,236,657), hereinafter referred to as Anderson.

These rejections are respectfully traversed for the reasons set forth below. Claim 2 is an independent claim. Claims 3-15 depend directly or indirectly on Claim 2.

Armitage discloses 'the specification of a generic Label Distribution Protocol (LDP) for Multi-Protocol Label Switching (MPLS)' (col. 2, lines 7-9). As quoted by the Examiner, at

column 1, lines 28-25, Armitage states:

> A mechanism and method is described by which Label Switched Paths (LSPs) can be explicitly established using a defined distribution protocol to meet requirements of users and networks. In particular, a negotiative protocol is defined for supporting Label Distribution in Multi-Protocol Label Switching (MPLS). This protocol allows for explicit route label setup, loop-free multicast tree setup, and label value negotiation.

Armitage discloses the steps associated with the generic label distribution protocol; and the formats used for the various label distribution protocol messages. The loop-free multi-cast tree setup is achieved by the use of the Traversal List Tree MEE (Figure 11, column 7, lines 36-54):

> This MEE (Message Extension Element) message may be included in Bind Requests in order to prevent rippling LDP messages in a loop (useful--for instance--in Multi-cast LSPs (Label Switch Paths) setup using upstream allocation).
>
> X: X is set to one, in LDP (Label Distribution Protocol) messages, as processing of this MEE is significant to message semantics yet an error due to not being able to interpret this MEE should not result in an Error message.
>
> Type: Type is set to 0x0006 in this embodiment of the invention.
>
> Address Length: Length in bits of each address in the list. All addresses in the list must be of the same length.
>
> Address 1 - N. Addresses of the LSRs (Label Switched Routers) which this LSP has traversed. On Receipt, this list must not contain the address of this LSR (as defined for the address family in the Common Message Header. In the event that it does, the message containing this MEE (Message Extension Element) is silently dropped.

Therefore, Armitage's disclosure of loop-free LSP setup is limited to the use of Traversal List Tree MEE. At a minimum, Armitage does not disclose or suggest three features of the amended Claim 2:

a) Sending a label splice message (LSM): the steps and the format of LDP taught by Armitage do not disclose or suggest the use of Label Splice Message (LSM); Consequently, Armitage does not disclose or suggest the sending of LSM towards the root of an MPLS tree.

b) Sending a splice acknowledgement message explicitly in response to the LSM. In fact, Armitage acknowledges that the only occasion that an acknowledgement message sent was during teardown of an LSP (column 4, lines 28-31):

> Except for teardown messages, reliable delivery of LDP (Label Distribution Protocol) messages is not required by the protocol. Thus, explicit acknowledgment is defined for teardown messages only.

c) Grafting a subtree to an MPLS tree in general. More specifically, grafting a subtree as discussed under a) and b).

At column 1, lines 37-47, and column 2, line 63 to column 3, line 15, Armitage discussed the basic idea of LDP as well as how LSP is setup and maintained:

> The basic idea is to specify portions of a label which are defined by the upstream neighbor in an adjacent pair of Label Switching Routers (LSRs). The portion of the label which is assigned by the upstream neighbor is defined as a bit mask which indicates those portions of the label which remain to be assigned by the downstream neighbor. If all bits are zero, the label is fully determined by the upstream neighbor, otherwise any bit in the mask is set-able by the downstream neighbor. The range of set-able addresses may be further refined through the use of generic extensions to the protocol.
>
> [. .]
>
> An LSR (Label Switched Router) needs to establish and maintain label-associations with the routing neighbors which it knows are LSR capable at any given time in order to provide MPLS functionality across negotiated LSPs. The local LSR may request label bindings 14 (associations of a label with a forwarding equivalency) from downstream neighbors (i.e.--those neighbors advertising reachability for L3 datagrams in that forwarding equivalency), it may create label bindings 15 for its up-stream neighbors (possibly as a result of a bind request) and it may remove bindings 16 (teardown an LSP) associated with specific forwarding equivalencies with any of its neighbors.
>
> The local LSR (Label Switched Router) may request a label bind 14 from downstream neighbors corresponding to forwarding equivalencies for which it received bind requests from upstream neighbors, for which it will ingress matching L3 datagrams or in anticipation of LDP bind requests from upstream neighbors. Until receiving a corresponding label bind, the local LSR forwards datagrams using routing (egressing corresponding LSPs if necessary).

Armitage does not, in above paragraphs or elsewhere, teaches or suggests: a) sending a label splice message; b) sending a splice acknowledgement message explicitly in response to the LSM; or c) grafting a subtree.

Claim 2 of the present invention is directed to a method for avoiding routing loops from forming when a node of a subtree is grafted to a MPLS tree. As defined in Claim 2, a label splicing message and a splice acknowledge message are used to graft the subtree to the MPLS tree without causing routing loops. When a label switching router LSR is to be attached to a MPLS tree, the label switched path to the root of the MPLS tree is verified to be loop free before splicing label switched paths (on page 11, lines 25-28). The node (Rx) of a subtree, which decides to attach to the MPLS tree, sends a label splice message Lsm (on page 12, lines 22-23) When the label splice message is reached at the root node, the root node returns

a splice acknowledgement message ACK on the same labelled path (on page 12, lines 9-12). If 1) the splice acknowledgement message returns to the node, and 2) the node is not waiting for a previous splice acknowledgement message, it is declared that grafting the subtree to the MPLS tree does not cause routing loops. As described on page 16, lines 2-3, the mechanism of the present invention separates the loop-free verification from the path setup process.

The Examiner stated that Armitage disclosed, for Claim 2 of the instant application, the step of: 'b) if a label mapping request for the same FEC was not previously received at said node, sending a label splicing message (Lsm) towards the root of said MPLS tree along a labelled path' in Figure 4, at col. 3, lines 17-33 and at col. 9, lines 58-61.

Applicants respectfully disagree and request the withdrawal of the rejection.

Armitage stated at col. 3, lines 17-33, and in Figure 4:

> On receiving a bind request 17 from an upstream neighbor, an LSR (Label Switched Router) may respond with a label bind immediately 18 or it may wait for corresponding label binds from its downstream neighbors 19. The local LSR may provide a label bind immediately if it: (1) has corresponding downstream labels, or (2) it will act as egress for the corresponding LSP. If the LSR does not provide an immediate bind, it may continue to receive unlabeled L3 datagrams from the requesting neighbor until such time as it does provide the requested bind 20. If the LSR has elected to wait for corresponding downstream label binds, it may create a label bind for upstream neighbors at a later time (when it has obtained these binds and spliced them 21 with the labels it will use in binds to upstream neighbors).
>
> On receiving a label bind from a downstream neighbor 20, an LSR may immediately splice this label to labels it has provided, or will provide, to its upstream neighbors 21.

In above two paragraphs, Armitage disclosed two possibilities for a local LSR upon receiving a bind request: provide a label immediately; or wait for downstream binding. Although it uses the term 'splice', it should be apparent to a person skilled in the art that Armitage is referring 'to splice' labels, not a label splicing message.

Armitage further stated at col. 9, lines 58-61:

> If the Bind Request can be satisfied by the local LSR, the LSR creates a binding, splices it in the LIB, builds a Label Bind message as described in section 2.5 below and sends it to the requesting neighbor.

In this paragraph Armitage disclosed how a downstream LSR responds to a Bind Request sent by the upstream LSR, it should be apparent to a person skilled in the art that the

term 'binding' refers to the mapping of a FEC to a label, and LIB is label information base maintained by an LSR. Therefore, 'splices it in the LIB' refers to updating of label to FEC binding in the label information base.

Therefore, Armitage at col. 3, lines 17-33 and at col. 9, lines 58-61 does not disclose or suggest the element b) of Claim 2: sending a label splicing message (Lsm) towards the root of said MPLS tree.

The Examiner further stated that Armitage disclosed the step of: c) generating a splice acknowledgement message (ACK) by said root node in response to said Lsm (on col. 9, lines 58-61 of Armitage).

Applicants respectfully disagree and request the withdrawal of the rejection

As discussed above, at col. 9, lines 58-61 of Armitage, neither the 'binding' nor 'splices it in the LIB' is related to 'generating a splice acknowledgement message (ACK) by said root node'. Furthermore, 'builds a Label Bind message' as described in section 2.5 of Armitage is the process whereby the downstream LSR sends back a message to the upstream requesting LSR A label bind message of LDP is not a splice acknowledgement message defined by the instant invention.

Therefore, Armitage at col. 9, lines 58-61 does not disclose or suggest the element c) of Claim 2: generating a splice acknowledgement message (ACK) by said root node in response to said Lsm.

The Examiner stated that Armitage disclosed the step of: d) declaring loop-free and accepting said binding if said node is not waiting for a previous ACK corresponding to a previously received Lsm and said ACK returns to said node on the same said labelled path (on col. 1, lines 31-35 and col. 2, lines 45-54 of Armitage).

Applicants respectfully disagree and request the withdrawal of the rejection.

Armitage at col. 1, lines 31-35 states:

> In particular, a negotiative protocol is defined for supporting Label Distribution in Multi-Protocol Label Switching (MPLS). This protocol allows for explicit route label setup, loop-free multicast tree setup, and label value negotiation.

This paragraph is directed to LDP in general. It does not disclose or suggest the elements in d) of Claim 2: declaring loop-free, accepting a binding; an ACK; or an Lsm.

And Armitage at col. 2, lines 45-54 states:

> The local LSR (Label Switched Router) sends notification messages 10 periodically (once in a notification period) to each routing neighbor until it has both sent and received such a notification for that neighbor. This notification message 10 may be sent periodically thereafter in order to maintain the neighbor relationship 11. Once a neighbor relationship has been established, normal LDP (Label Distribution Protocol) control traffic received from a neighbor within the notification period is sufficient to maintain the relationship.

This paragraph teaches the use of notification message to establish neighbor relationship. It does not disclose or suggest the elements in d) of Claim 2. declaring loop-free; accepting a binding; an ACK; or an Lsm.

The Examiner further stated that Armitage disclosed the step of: e) informing all member nodes said subtree was grafted to said MPLS tree (on col. 2, lines 45-54 of Armitage).

As discussed above, Col. 2, lines 45-54 of Armitage disclosed the use of notification message to establish neighbor relationship. It does not disclose or suggest the elements in e) of Claim 2: informing all member nodes, or grafting a subtree to an MPLS tree.

Anderson discloses a process for setting up point-to-multipoint and multipoint-to-point connections. However, Anderson neither discloses nor suggests avoiding routing loops using a label splicing message and a splice acknowledgement message as defined in Claim 2. Anderson does not remedy the deficiencies of Armitage discussed above to render Claims 9 and 10 unpatentable.

Hence it is respectfully submitted that Claim 2 and its dependent Claims 3-15 are new and patentably distinguished over the cited references. Applicants respectfully request that the Examiner withdraw the rejections.

In view of the above amendments and remarks, and having dealt with all of the matters raised by the Examiner, early reconsideration and allowance of the application is respectfully requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 625-3507. All correspondence should continue to be directed to our address given below.

Respectfully submitted,

Attorney for Applicants
Dawn C. Hayes
Registration No. 44,751

PATENT ADMINISTRATOR
KATTEN MUCHIN ZAVIS ROSENMAN
525 West Monroe Street
Suite 1600
Chicago, Illinois 60661-3693
Facsimile: (312) 902-1061